

FORMULATION AND EVALUATION OF HERBAL TOOTHPASTE

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ABSTRACT

Toothpastes have been used since the ancient past 1 and are one of main irreplaceable components of oral health care. The design of toothpaste formulations began in China and India, as 300-500 BC. During that period, squashed bone, pulverized egg and clam shells were utilized as abrasives as a part of tooth cleaning.

The weight off every ingredient was decided by reviving preims hetal toothpaste formulations, The combination of percentage by weight of all the ingredients of this is 100%, which means the sum of quantity of toothpaste Will fornulzte1yn of toothpaste. The ingredients of the toothpaste prepared in lah are given in table 1 znd compared with marketed herbal tooth pastes Meswak. and Sudanta end Dabur red. Herbal tooth paste was prepared using guava leaves extract, tulsi, banyan, acacia, calcium carbonateandsodiumlaurylsulphate. Guava extract gives relief from toothache, Neem leaf has antibacterial activity, Ginger gives antiseptic property and bad breath of mouth is prevented by tulsi. Banyan is used against toothache. Acacia to prevent gingivitis and also acts as gelling agent. Sodium lauryl sulphate is used as a foaming agent & Para hydroxy benzoic acid is used as a preservative. PSaccharin sodium acts as sweetening agent; amaranth is used as colourant and water as vehicle.

KEYWORDS:- Toothpaste, formulation, ingredients,vehicle,foaming.

INTRODUCTION

Toothpastes have been used since the ancient past 1 and are one of main irreplaceable components of oral health care. The design of toothpaste formulations began in China and India, as 300-500 BC. During that

period, squashed bone, pulverized egg and clam shells were utilized as abrasives as a part of tooth cleaning. some are may lack motivation for these procedures. The therapeutic effect showing plants has been beneficial to the oral health from the thousands of year throughout the world. The traditional medicine has advantage more than the side effect like allergies



Neem is one of the most widely researched tropical trees for the development therapeutic action. 20 years ago the component of neem extract was analyzed. The chewing sticks have been widely used in the Indian subcontinent, the Middle East and Africa since ancient time period. Dental caries is steadily increasing in the underdeveloped and developing country.

Hence, there is an urgent need to promote traditional preventive measures that are acceptable, easily available and cost effective. The neem has been antibacterial activity is has evaluated from the ancient times. It has been used for the various activities like astringent, antiseptic, insecticidal, anti-ulcer and for cleaning the teeth in pyorrhea and other dental disease. The leaf extract of neem showed superior antiviral and anti-hyperglycemia activity in vitro and in vivo on animals. It showed good in vitro broad range antibacterial activity. Nanotechnology may be defined as the creation of material, drug and devices that are used to manipulate matter that in specific size and increase the drug targeting.



Here is a look at halitosis, other common dental problems, and treatment options for catch one.

1. Tooth Decay

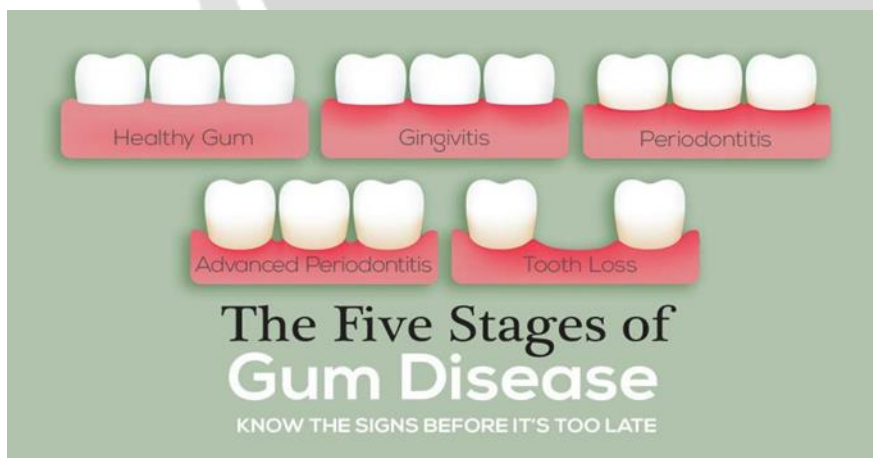
Tooth decay is also known as dental caries or dental cavities. It is the most common dental problem that dentists see in patients.

The bacteria produce acids from the sugars in food.

The acids eat away at and permanently damage the enamel or outer layer of the tooth.

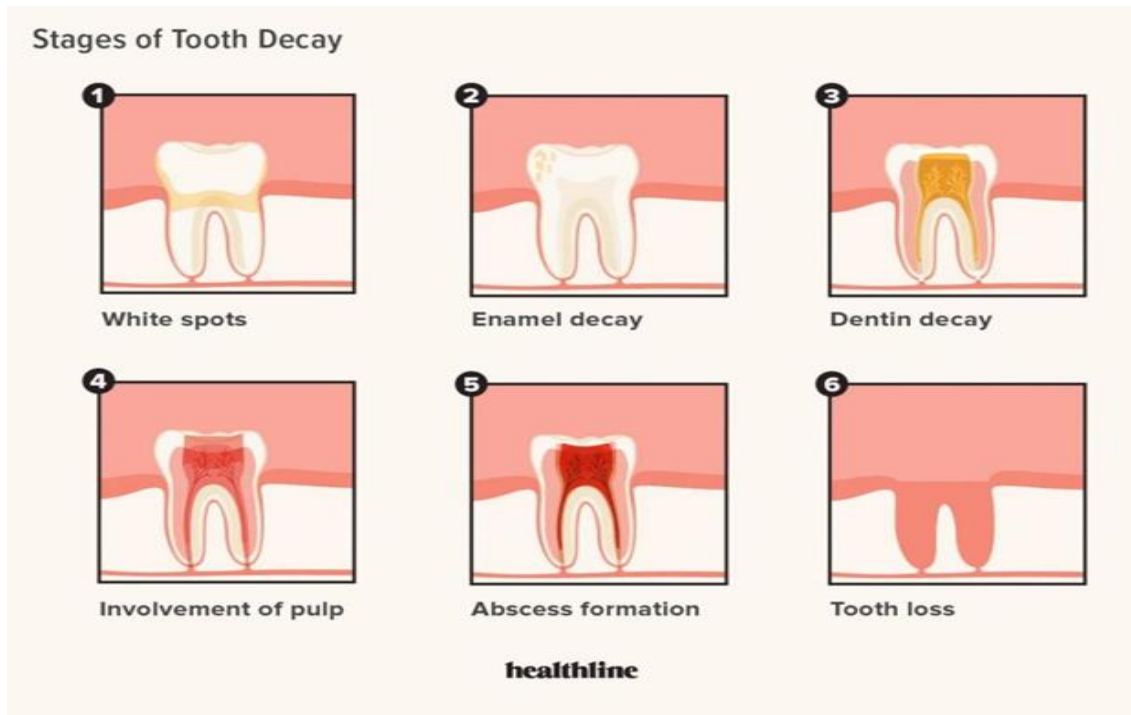
The acids then start working on the softer dentin layer beneath the enamel

This break down of the tooth can lead to cavities or holes in your teeth. It can also cause toothaches, including pain when you eat and drink hot, cold or sweet things.



2. Gum Disease

Gingivitis is the early stage and mild form of gum or periodontal disease. It is a bacterial infection that is caused by the buildup of plaque. Common symptoms are gums that are red, swollen, and bleed easily. Skipping brushing and poor brushing techniques can contribute to gum disease



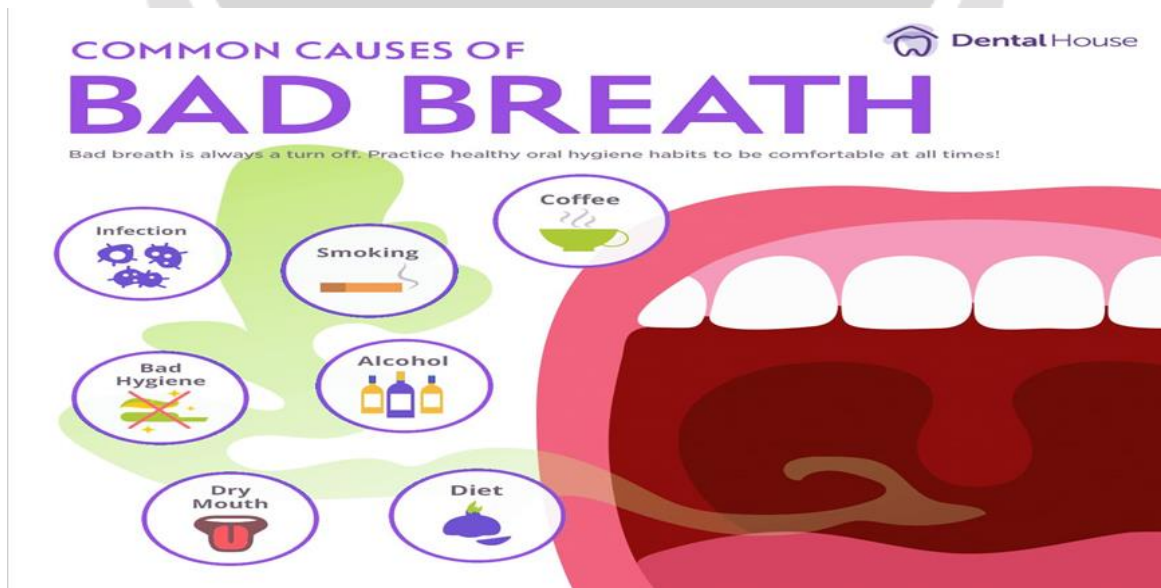
3. Bad Breath

Bad breath or halitosis is one of the most common dental problems.

It is also among the most distressing.

Bad breath can be caused by several different factors, including:

- i. Poor oral hygiene
- ii. Dry mouth
- iii. Medication infection
- iv. Acid reflex
- v. Cancer



4.Sensitive Teeth

Your teeth become sensitive to hot and cold foods and drinks when the enamel is worn away and the dentin is exposed.

DRUG AND EXCIPIENT PROFILE DRUG PROFILE A.GUAVA LEAVES

- Guava is a tree that grows in Central and South America.
 - The fruit is commonly eaten fresh or made into beverages,jams, and other foods.
 - Various parts of the plant, including the leaf and the fruit, are used as medicine.
- People use guava leaf for stomach and intestinal conditions, pain,diabetes, and wound healing



Benefits of guava leaves

- Well depend on western medicine for simple problems like fever, cold, cough etc.
- But, don't forget that guava leaves are very healthy too.
- If guava fruit is healthy, then its leaves are super healthy.
- Here are some of the benefits of guava leaves that you need to know.
 - Helps in stopping diarrhoea
 - Helps reduce cholesterol levels
 - Helps in losing weight helps to manage blood sugar levels
 - Helps to fights cancer
 - Helps in good vision
 - Used for healing acne
 - Helps in improving your skin texture

B. BANYAN BARK

- Banyan tree, scientifically known as *Ficus benghalensis*, is a large and evergreen tree belonging to the Moraccae family.
- It is called Bargad in Hindi and Urdu, Banyan, East Indian Fig and Indian Fig in English and Bahupada or Vat in Sanskrit.
- It is one of the most important trees in Indian history. It is the national tree of India.
- It is grown in India, Pakistan and Sri Lanka.
- It is a woody tree with a long lifespan.
- All parts of the Banyan tree: fruits, leaves, roots and barks are used in ethno medicine.

- The seeds of the Banyan tree are a rich source of carbohydrates and proteins. In addition, the seeds also contain lipids, fibre, Vitamin C and Vitamin E.
- The nutritional value of these seeds is around 130 calories per 100 grams.
The seeds also contain minerals like sodium, potassium, calcium, manganese, Iron, chromium, copper and phosphorous



C. NEEM

- Neem (*Azadirachta indica*) is a tree that grows in tropical regions such as India.
 - The leaf extract is used to reduce tooth plaque and to treat lice.
 - Neem contains chemicals that might help reduce blood sugar levels, heal ulcers in the digestive tract, prevent pregnancy, kill bacteria, and prevent plaque from forming in the mouth.
 - People use neem for lice, tooth plaque, gingivitis, psoriasis, to repel insects, and for many other purposes, but there is no good scientific evidence to support most of these uses.
 - There is also no good evidence to support using neem for COVID-19.
 - Neem seed oil is used as a pesticide.
- Neem leaves used for leprosy, eye disorders, bloody nose, intestinal worms, stomach upset, loss of appetite, skin ulcers, diseases of the heart and blood vessels (cardiovascular disease), fever, diabetes, gum disease (gingivitis), and liver problems.



BENEFITS OF NEEM LEAVES

- **Dental plaque.** Early research suggests that applying neem leaf extract gel to the teeth and gums twice daily for 6 weeks might reduce plaque formation. It also might reduce the number of bacteria in the mouth that can cause plaque. However, using a mouth rinse containing neem extract for 2 weeks does not appear to reduce plaque or gingivitis.
- **Insect repellent.** Early research suggests that applying extract of neem root or leaf to the skin helps repels black flies. Also, applying neem oil cream to the skin seems to protect against some types of mosquitoes.
- **Ulcers.** Some research suggests that taking 30-60 mg of neem bark extract twice daily by mouth for 10 weeks helps heal stomach and intestinal ulcers.
- **Psoriasis.** Early research suggests that taking neem extract by mouth for 12 weeks, along with daily sun exposure and the application of a coal tar and salicylic acid cream, reduces the severity of psoriasis symptoms in people.
- Fever.
- Upset stomach.
- Breathing conditions.
- Malaria.
- Worms
- Head lice
- Skin conditions and diseases.
- Heart disease.

D. TULSI

- *Ocimum tenuiflorum*, commonly known as holy basil, tulsi or tulasi, is an aromatic perennial plant in the family Lamiaceae.
- It is native to the Indian subcontinent and widespread as a cultivated plant throughout the Southeast Asian tropics.
- Tulsi is cultivated for religious and traditional medicine purposes, and also for its essential oil.
- It is widely used as a herbal tea, commonly used in Ayurveda, and has a place within the Vaishnava tradition of Hinduism, in which devotees perform worship involving holy basil plants or leaves.
- The variety of *Ocimum tenuiflorum* used in Thai cuisine is referred to as Thai holy basil and is the key herb in phat kaphrao, a stir-fry dish; it is not the same as Thai basil, which is a variety of *Ocimum basilicum*.
- It is used as
 - Insect repellent
 - Nematicidal

Disinfection

- From the leaves to the seed, holy basil is considered a tonic for the body, mind, and spirit.
- Different parts of the plant are recommended for treating different conditions:
 - o Use its fresh flowers for bronchitis.
 - o Use the leaves and seeds, with black pepper, for malaria.

**E. GINGER**

- Ginger (*Zingiber officinale*) is a plant native to India.
- The ginger spice comes from the roots of the plant.
- It's used as a food flavoring and medicine.
- Ginger contains chemicals that might reduce nausea and swelling.

**Possibly Effective for**

Nausea and vomiting caused by drugs used to treat HIV/AIDS (anti retro viral-induced nausea and vomiting). Taking ginger by mouth daily, 30 minutes before each dose of anti retro viral treatment for 14 days, reduces the risk of nausea and vomiting in patients receiving HIV treatment. Menstrual cramps (dysmenorrhea). Taking ginger by mouth during the first 3-4 days of a menstrual cycle somewhat reduces painful menstrual periods. It seems to work about as well as some pain medications, like ibuprofen, meloxicam, or Novafen. Taking ginger along with medicines such as meloxicam also seems to be helpful. Osteoarthritis. Taking ginger by mouth can slightly reduce pain in some people with osteoarthritis, But applying ginger gel or oil to the knee doesn't seem to help. Morning sickness. Taking ginger by mouth seems to reduce nausea and vomiting in some people during pregnancy. But it might work slower or not as well as some drugs used for nausea.

Possibly Ineffective for

Muscle soreness caused by exercise. Taking ginger by mouth doesn't reduce or prevent muscle pain from exercise. Motion sickness. Taking ginger by mouth up to 4 hours before travel doesn't prevent motion sickness. There is interest in using ginger for a number of other purposes, but there is not enough reliable information to say whether it might be helpful.

F. ACACIA

Acacia, commonly known as the wattles or acacias, is a large genus of shrubs and trees in the subfamily Mimosoideae of the pea family Fabaceae. Initially, it comprised a group of plant species native to Angola and Australasia. The genus name is New Latin, borrowed from the Greek *Kayak* (*akinesia*), a term used by Clitorides for a preparation extracted from the leaves and fruit pods. Machiavelli's amniotic, the original type of the genus. In his *Pinax* (1623), Asgard Baudouin mentioned the Greek *Kawasaki* from Clitorides as the origin of the Latin name. In the early 2000s it had become evident that the genus as it stood was not monopolistic and that several divergent lineages needed to be placed in separate genera. It turned out that one lineage comprising over 900 species mainly native to Australia, New Guinea. This meant that the Australasian lineage (by far the most prolific in number of species) would need to be renamed. Botanist Leslie Pedley named this group *Racosperma*, which received little acclaim in the botanical community. Australian botanists proposed a less disruptive solution setting a different type species for *Acacia* (*A. penninervis*) and allowing this largest number of species to remain in *Acacia*.



A. CALCIUM CARBONATE

Calcium carbonate is an inorganic salt widely used in the management and treatment of low calcium conditions, GERD, CKD, and various other indicated conditions. It is classified as a calcium supplement, antacid, and AMD phosphate binder. This activity outlines the significant indications, actions, and Contraindications for calcium carbonate as a valuable agent in treating osteoporosis, hypothyroidism, rheumatoid arthritis, many other conditions or disorders that lower serum calcium levels. This activity will highlight the mechanism of action, adverse event profile, and other key factors (e.g., off-label uses, dosing, pharmacodynamics, pharmacokinetics, monitoring, relevant interactions) pertinent to members of the healthcare team in the care of patients with low serum calcium, GERD, CKD, and related conditions.

Objectives:

- Identify the mechanisms of action of calcium carbonate.

- Calcium carbonate, chemically CaCO_3 , is a resonance-stabilized inorganic salt therapeutically used as a food additive, a dietary supplement, an antacid, and a phosphate binder.



B. GLYCERIN

Glycerol or more commonly it is glycerin. It is an organic alcohol that is a mixture of sugar and alcohol and is fully miscible in water. Due to its properties, glycerin is in use a way or the other in nearly every industry. It is a simple poly compound with three hydroxide group (-OH) attached to it. Glycerin is a simple poly compound. This solvent has a chemical formula $\text{C}_3\text{H}_8\text{O}_3$. It is also known as Glycerol or glycerine. It is hygroscopic in nature. Glycerin is found in lipids like triglycerides. It is obtained from animal and plant sources. It is water-soluble due to three hydroxyl groups. Glycerin is produced through the processes like saponification, hydrolysis, trans esterification of triglycerides. Synthetic glycerol can be produced by propylene. Glycerin has a molar mass or molecular weight of 92.09 g/mol. The density of glycerin is 1.261 g/cm³. The boiling point of glycerin is 290°C. The melting point of glycerin is 17.8°C. In the late 1700s K. W. Scheele, the Swedish chemist accidentally discovered glycerin.

Formation of Glycerin

- From Natural Sources

From Artificial Sources

Physical Properties of Glycerin

Physically, glycerin or glycerol is soluble, nearly colourless, odourless, clear, viscous, hygroscopic liquid with a very high boiling point. The boiling point of pure alcohol at gas pressure (760 mm) is 290 degrees C.

Uses of Glycerin

The primary use of glycerin is in the food and beverage industry.

Glycerin is useful as a humectant, sweetener, and solvent.



C. SODIUM LAURYL SULPHATE

Sodium lauryl sulfate (SLS) is one of the ingredients you'll find listed on your shampoo bottle. However, unless you're a chemist, you likely don't know what it is. The chemical is found in many cleaning and beauty products, but it's frequently misunderstood. SLS is what's known as a "surfactant." This means it lowers the surface tension between ingredients, which is why it's used as a cleansing and foaming agent. Most concerns about SLS stem from the fact that it can be found in beauty and self-care products as well as in household cleaners. Sodium lauryl sulfate (SLS) is a surfactant with a similar chemical formula. However, SLS is milder and less irritating than SLS.

**D. SODIUM SACCHARIN**

Sodium saccharin is a chemical derived from coal tar. It is one of five artificial sweeteners approved by the US Food and Drug Administration. You may remember there was concern about saccharin's safety, but early studies that linked it to cancer in rats were reexamined and found not to translate to cancer risk in humans. Sodium saccharin is extremely sweet, so small amounts make toothpaste palatable and better tasting. Still, sodium saccharin is not linked to any benefits for oral health, so its only function in a toothpaste is to improve flavor.

Its functions (INCI)

- Masking: Reduces or inhibits the odor or basic taste of the product
- Oral care/hygiene agent : Provides cosmetic effects to the oral cavity (cleaning, deodorization and protection)
- Flavouring : Gives an aroma to the cosmetic product.

E. PARA HYDROXYL BENZOIC ACID

p-Hydroxy benzoic Acid (PHBA) [4-Hydroxybenzoic acid] is a mono hydroxy benzoic acid, a phenol derivative of benzoic acid. It is a white crystalline solid that is slightly soluble in water and chloroform but more soluble in polar organic solvents such as alcohols and acetone. p-Hydroxy benzoic Acid (PHBA) [4-Hydroxybenzoic acid] is primarily known as the basis for the preparation of its esters, known as parabens. 4-hydroxybenzoic acid is a widely used organic synthetic raw material, especially its esters, including methyl paraben (nopoline), ethyl ester (interpret), propyl ester, butyl ester, isopropyl ester, iso butyl ester, can be soda, fruit flavorings, fruits and vegetables, pickled products, etc., also used as food additives.

MATERIALS AND METHODS**MATERIALS**

The weight of every ingredient was decided by reviving previous dental toothpaste formulations. The combination of percentage by weight of all the ingredients of this is 100%, which means the sum of quantity of toothpaste will formulate 1 g of toothpaste. The ingredients of the toothpaste prepared in lab are given in table

1st compared with marketed herbal tooth pastes Meswak. and Sudanta end Dabur red. Herbal tooth paste was prepared using guava leaves extract, tulsi, banyan, acacia, calcium carbonate and sodium lauryl sulphate. Guava extract gives relief from toothache, Neem leaf has antibacterial activity, Ginger gives antiseptic property and bad breath of mouth is prevented by tulsi. Banyan is used against toothache. Acacia to prevent gingivitis and also acts as gelling agent. Sodium lauryl sulphate is used as a foaming agent & Para hydroxy benzoic acid is used as a preservative. P Saccharin sodium acts as sweetening agent; amaranth is used as colourant and water as vehicle.

| S.no | Common Name | Botanical Name | Parts Used | Category | % |
|------|---------------------------|---------------------|------------|--------------------------|------|
| 01 | Guava extract | Psidium guava | leaves | Relieve the toothache | 10.5 |
| 02 | Banyan | Fiscusbengalensis | Bark | Prevent toothache | 06 |
| 03 | Neem | Azadirachta indica | Leaves | Antibacterial | 05 |
| 04 | Tulsi | Ocimum tenuiflorum | Leaves | Prevent bad breath | 05 |
| 05 | Ginger | Zingiber officinale | Root | Antiseptic | 05 |
| 06 | Acacia | ----- | ----- | Prevention and treatment | 03 |
| 07 | Calcium carbonate | ----- | ----- | Abrasive | 31 |
| 08 | Glycerine | ----- | ----- | Humectant | 30 |
| 09 | Sodium lauryl sulphate | ----- | ----- | Detergent | 1.50 |
| 10 | Sodium saccharin | ----- | ----- | Sweetening agent | 0.30 |
| 11 | Para hydroxy benzoic acid | ----- | ----- | preservative | 0.15 |
| 12 | menthol | ----- | ----- | Flavouring agent | 1.5 |
| 13 | Amaranth | ----- | ----- | Coloring agent | 0.5 |
| 14 | water | ----- | ----- | vehicle | Q.s |

METHODS

Preparation of extracts: The tender Leaves(100 grams) were extracted by two methods.
Method-1:Continuous hot extraction is performed with absolute alcohol at 50°C.

Procedure:

Guava leaves were taken and washed in order to take out impurities from them. They were shade dried for about 5 days, after proper drying,they were grounded to a fine powder which was passed through sieve No.-6. The powder was packed in soxhlet apparatus and continuously extraction process was done for about 7 hours at 50°C with ethanol. After the extraction process, the product was collected and shade dried for 10 days and the extract was powdered. All the herbal ingredients were dried and grounded using domestic mixer. The required

quantities of the ingredients were weighed and taken in mortar. P Calcium carbonate, sodium lauryl sulphate, glycerine and saccharin sodium were mixed in water. P Para hydroxy benzoic acid, menthol and acacia were added into the above mixture. This solution was added drop wise into mortar containing herbal ingredients and triturated well until a paste consistency is formed. Method-2:

The leaf samples were washed, dried and blended into powder. > Increasing polarity solvents such as methanol(>95%), n-hexane(>95%), ethanol I(>99.5%), and boiling distilled water were used in the maceration process. The leaf powder was incorporated into each of solvents to prepared 20% Concentration. The mixture was mixed in Erlenmeyer flask, wrapped the flask with umfoil to avoid solvent evaporation and then exposed it to light for three consequent days at room temperature. The contents were shaken with platform shaker at 70 rpm. The mixture was soaked for 3 days, the contents were transferred to 50 ml test tube and again centrifuged for 10 min at 4000rpm in room temperature. Finally, the super natant liquid was separated and stored in refrigerator at 40C until it becomes useful in the procedure.

| S.NO | PROPERTIES | LAB MADE | MESWAK | DAUBER RED |
|------|---|----------|---------|------------|
| 01 | Hard and sharp edged abrasive particles | Absent | present | Absent |
| 02 | Abrasiveness | 04 | 03 | 02 |
| 03 | Spread ability | 5.6 | 5.2 | 4.0 |
| 04 | ph | 8.5 | 8.6 | 8.1 |
| 05 | stability | Good | Good | Good |
| 06 | Fineness | 0.41 | 0.38 | 0.41 |
| 07 | Moisture and volatile matter | 1.8 | 2.0 | 1.8 |
| 08 | Test for pb | 05 | 06 | 11 |
| 09 | Foaming ability | 75 | 66 | 70 |
| 10 | Flouride ion ppm max | 40 | 35 | 46 |

RESULTS AND DISCUSSION

Evaluation tests of toothpastes were carried out according to the standards specified by the Bureau of Indian standards IS 6356-1993 for Herbal tooth pastes samples (Meswak, Dauber red, Sudanta) and Lab made toothpaste sample. the samples were complied with BIS and they found to be of good quality. Evaluation tests were carried out to view the different properties of Lab made and commercial toothpastes. All the results of evaluating parameters were given in table2, In the present study, comparatively equal and rarely better results have been observed with Lab made formulation than marketed formulations. Both preparations have shown equal efficacy in terms of foaming ability. But increased activity in terms of a brasiveness and spread ability was appeared in Lab made formulation . Comparison of the abrasiveness of marketing pastes with Lab made formulation suggests that Lab made formulation has more abrasiveness than marketed pastes. All the tooth pastes were having good consistency and smooth texture. Also shown no symptoms for deterioration such as phase separation, gassing,fermentation when all the samples were placed at a temperature of 4542°C for a period of28 days.

It confirmed that the toothpaste is stable. E preferable.amount of residue has retained on sieve for Lab made formulation which is better than the residue obtained by commercial tooth found that Lab made preparation has shown reasonably good % of ineness The moisture and volatile matter present in Meswak was significantly more then the rs of the formulations. The percent of moisture and volatile content in Lab made formulation has the same percent of moisture as that of Dabur red and Sudanta. These results explain that moisture and volatile content are within the limits. The color produced with hydrogen sulfide in test solution

is less than chained wit standard solution indicating that amount of lead is with in the acceptance criteria. Fluoride ions present in the sample were potentiometrically determined by fluoride ion sensitive electrodes.

CONCLUSION

Herbal tooth paste an emphasized role in maintaining the oral hygienic nature as well as preventing dental caries, Based on this pattern, Lab made Herbal toothpaste was formulated by selecting suitable to ingredients to get the formulation more stable. Evaluation and comparison of results with commercial Herbal toothpaste, demonstrated to Lab made toothpaste is having equal patronizing and engrossing passion over the marketed formulations (Meswak, Dauber red and Sudanta). All the marketed Herbal tooth pastes and Lab made Herbal toothpaste are evaluated and compared with the standard specified by Bureau of Indian standards, This preliminary in vitro study demonstrated that Lab made Herbal toothpaste was equally efficacious. As three commercially popular toothpastes in terms of all evaluation properties of toothpaste. Hence, by the evidence of in vitro studies, it is concluded that Lab made Herbal toothpaste formulated in a laboratory was found to be of good quality.

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